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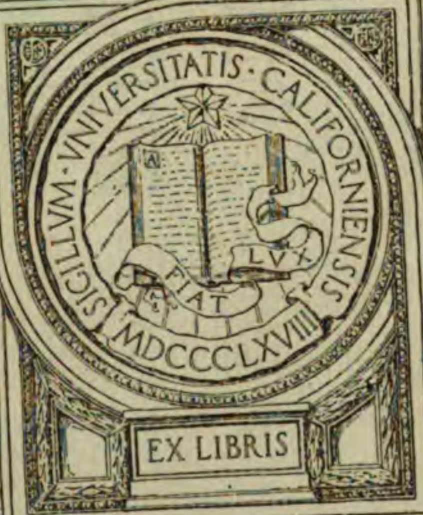

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The Eradication of Ankylostomiasis

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By H. H. HOWARD, M.D.
Director for the West Indies

[illegible]
Washington, D. C.
[illegible]

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The Eradication of Ankylostomiasis

Methods and Administrative Measures as Illustrated by the Campaign in British Guiana.

By H. H. HOWARD, M. D.,
Director for the West Indies

OFFICES OF THE COMMISSION
Washington, D. C., U. S. A.
1915

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INTRODUCTORY NOTE.

This pamphlet has been prepared in answer to numerous requests, received from both official and private sources, for information regarding the administrative problems of the work of the eradication of Ankylostomiasis.

From a knowledge of the methods in use during the last four years in Ankylostome eradication in the United States, together with the experience gained in the introduction and establishment of the work in British Guiana, the attempt has been made in these pages to place at the disposal of any who may be interested, the resulting considerations. It is hoped that they may be of value in the introduction of the work into new territory, where they may serve, if in no other way, as a starting-point from which better methods may be developed and perfected.

Special attention is called to the forms which appear in the last pages. It is most important that an accurate, comprehensive, intelligible record be made of all work done. The forms submitted show how this was done in British Guiana. The methods set forth have met the test of practical application and would seem worthy of trial wherever such work is to be undertaken.

H. H. Howard, M. D.,
Director for the West Indies.

430288

Washington, D. C., *September 15, 1914.*

THE ERADICATION OF HOOKWORM DISEASE.

This subject is discussed under thirteen heads, indicating the successive steps in the development of the work, as follows:

1. Selection of Unit of Area of Operation.
2. Publicity and Educational Measures.
3. Census Taking.
4. Microscopic Examination.
5. Treatment.
6. Re-examination.
7. Working Force.
8. Financial Procedures.
9. Duration of Campaign.
10. Sanitary Measures for Prevention.
11. Per Capita Cost.
12. Is Complete Eradication Possible?
13. Forms and System of Reports.

I. SELECTION OF UNIT OF AREA OF OPERATIONS.

The first attempt at complete eradication of Ankylostomiasis in foreign fields in which the International Health Commission has co-operated was in British Guiana. It had its beginning in the early months of 1914.

Following a visit of Mr. Wickliffe Rose, Director-General of the International Health Commission, to that Colony in October 1913, a working-plan and budget were prepared by the Surgeon-General, with the assistance of Dr. J. E. A. Ferguson, Medical Officer of Peter's Hall District, and submitted to the International Health Commission. The plan and budget having been adopted, it was determined that the area of operation in this preliminary campaign should be a Medical District.

Peter's Hall District, just south of the city of Georgetown, was selected. This District is approximately eight miles long and from one to three miles wide, with a population of 14,000 people, exclusive of the indentured labor of the sugar plantations.

In this territory there are very few isolated dwellings. The people live in a chain of villages, varying in size from 200 to 4,000 inhabitants, lying along the east bank of the Demerara River.

We were not to deal with the indentured plantation labor, as this feature of the problem was being handled effectively by the District Medical Officer, Dr. J. E. A. Ferguson, the cost of this work being borne by the plantation owners.

On March 9, 1914, I arrived at Georgetown and was cordially received by the authorities as the representative of the International Health Commission.

Being familiar with the methods in use by the Rockefeller Sanitary Commission in combating hookworm disease in the United States, I was not long in recognizing that there were features of this problem in British Guiana not hitherto met with, either in the work done in the United States, or in the local effort to control the disease among the indentured coolies, because—

1. In the United States we had to deal with a fairly intelligent population of whites and blacks only, and with sanitary conditions uncomplicated by tropical rainfall and temperatures; while

the transmission of the disease from individual to individual is prevented during a considerable portion of the year by the low temperatures of the winter season, and the wearing of shoes.

2. The local effort to control Ankylostomiasis in the Colony had been confined to the indentured labor of the sugar estates—the rather docile East Indian coolies, who, under the necessary plantation discipline, were easily handled in making the required examination and administering treatment.

Our problem was to eradicate Ankylostomiasis in Peter's Hall District where the following conditions obtained:

1. Populated—

(*a*) By East Indians who had served out their indentures, and, who, together with the remainder of the population, were no longer subject to, nor tolerant of, discipline.

(*b*) By Portuguese, who seem especially susceptible to the disease, showing a large proportion of severe infections, but who, unfortunately, were often indifferent to our efforts to help them.

(*c*) By Chinese, who were disinclined to take medicine unless suffering acute pain.

(*d*) By "coloreds," who, on the whole, were intelligent and generally favorable to our campaign.

(*e*) By "blacks," of whom the more ignorant and illiterate class gave us the most trouble.

2. Re-infections were the rule rather than the exceptions at all seasons of the year because of the heavy rainfall, tropical temperature, absence of shoes, and the insanitary habits of the people.

It must be obvious that the task of unifying these very diverse elements of population and creating an active common interest in the eradication of a disease about which they were uninformed, was no small undertaking. Without precedents to follow, it was determined to begin experimentally on a small scale, and to test and develop methods by which our task could be accomplished.

To this end Peter's Hall District was divided into three areas varying in extent, and having respectively populations of 8,000, 3,500 and 2,800.

A more careful survey of the territory and the conditions to be met led us to limit our operations still further. At first, they were restricted to one village near the center of the district. This village, Agricola, had a population of 1,335 and presented average conditions. In the beginning our progress was naturally slow, but as success made us more and more confident, the campaign was extended to other villages until the whole of the area was under treatment.

Our experience here led us to arrive at the following conclusions with reference to what should be a "unit of area of operation":

A territory with—

(*a*) Legal or natural boundaries.

(*b*) An aggregate of population of not more than 15,000, and fewer if sparsely inhabited. This is probably the maximum which can be properly handled by one Medical Officer and clerical force.

(*c*) A Central Office, situated near the center of the District, where most of the clerical and microscopical work may be done, and where the large record-books may be kept, as it would entail much loss of time and expense to move the Central Office outfit from village to village during the progress of the work.

Wherever possible, a map of the Area of Operation should be made, of such size as to permit the indication of villages, isolated dwellings, schools, water-courses, roads, drainage-trenches, water-reservoirs, and all other details which are connected in any way with the work in hand. This was done, as far as was possible, in Peter's Hall District. The map was of great value to the Supervising Medical Officer and Staff, as it gave a more definite picture of the task with which all were dealing.

2. PUBLICITY AND EDUCATIONAL MEASURES.

In Agricola village there were 1,335 people who had never heard of Ankylostomiasis. They were to be informed about the disease and to become so interested in it that they would voluntarily submit themselves for examinations, and be willing, if found infected, to take treatment until cured.

Announcements of our selection of this village, as the first point of attack, were made in the daily papers of Georgetown. Here also were set forth a statement of our purposes, of the symptoms of the disease and methods of contracting it, of the ease with which it could be cured, and of the beneficial results of treatment.

Sheets containing the foregoing information were printed and scattered throughout the area, with the additional statement that when Agricola should become free from the disease, other villages along the east bank would be served in like manner, if they so desired. It was arranged to have some notice of the work appear once or twice a week in the daily papers of Georgetown, these notices being printed free of charge.

The opening lecture on Ankylostomiasis was arranged for, special seats being reserved for His Excellency, the Governor, the Medical Officers of the Colony, heads of Government departments, the two resident Bishops, the clergy of Georgetown and the near-by villages, plantation-owners and managers, village officials, and school-teachers, all of whom were especially invited. The attendance was far beyond the capacity of the building.

The speaker was introduced by Surgeon-General Godfrey, and delivered a lecture on Ankylostomiasis. The magic-lantern, with the usual complement of slides, was used, and in a general way it was shown how we hoped to serve the best interests of the people by treating them and curing them of the disease. Several typical examples were shown to the audience at the conclusion of the lecture. Dr. J. E. A. Ferguson, District Medical Officer, also presented a number of interesting cases, bringing out forcibly the intimate relationship between Ankylostomiasis and the maternal death-rate at childbirth.

Following these demonstrations, Surgeon-General Godfrey pledged us the hearty support of the Medical and Sanitary Departments of the Colony. His Excellency, the Governor, Sir Walter Edgerton, spoke very favorably of the campaign, expressing his gratitude for the help given by the International Health Commission, and at the close of his remarks proposed a vote of thanks to the Commission and their representative, which met with a hearty response from the audience.

The presence of the Governor-General, the Surgeon-General, the prominent officials, the Bishops, the clergy and many others of wide influence, necessarily gave the campaign a great impetus.

Other lectures were delivered at the schools of Agricola, and throughout the area, and one lecture especially for those who were unable to secure seats or standing-room at the opening lecture. Other informal talks were made at the Dispensary, illustrated from time to time, with the hookworm chart, and the ova and live embryos were shown under the microscope.

As the work progressed it became necessary for the Medical Officer to call in person on a number of the villagers and persuade them to co-operate, explaining to them that our sole desire was to render them a service without any cost to them.

To secure publicity for the campaign, and to educate the people concerning Ankylostomiasis, our efforts were directed through the following channels:

1. (Through local papers.) Articles dealing with Ankylostomiasis in a simple way; that is, detailing its symptoms, its harmful effects, its prevalence, the methods of examination, the nature of treatment, the certainty of speedy cure, place and time of free examination, etc., were furnished to the local press, and also printed in sheet form and distributed throughout the District.
2. Statements from medical authorities and Government officials endorsing the work and asking for the cooperation of the people were secured and given wide publicity.
3. Illustrated lectures were delivered wherever a sufficient number of people could be assembled.[1]
4. Special literature on Ankylostomiasis illustrated with cuts showing cases before and after treatment, etc., were distributed freely.[2]
5. The co-operation of village authorities, schoolmasters, clubs, Baby-Saving Leagues, and Church organizations, was secured and every worthful kind of local influence was enlisted in the campaign. The pastors of the churches and the schoolmasters were especially helpful.

3. CENSUS TAKING.

In order to make effective any plan for the complete eradication of Ankylostomiasis, the first steps are to secure a complete and correct census embracing all individuals within the field of operation; to record the personal history of each as to name, race, sex and age; and to number or mark each house so that these individuals may be located at any time.

This in itself is a considerable undertaking, and was made more difficult in Peter's Hall District by the dense crowding of the people in some of the villages, and their tendency to shift and move about, many of them not having a permanent place of abode.

To take the census it was necessary to have men who could write legibly and who possessed some clerical ability. Under the Chapter on "Personnel of Force" it is provided that there shall be a male nurse and one assistant to each 1,200 inhabitants, for the purpose of administering the thymol. When the nurses and their assistants were employed care was taken that they should possess the qualifications necessary to census-takers, since it was not only economy to have them thus employed, before the actual treatment of cases began, but it afforded them an opportunity to get acquainted with the people.

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[1] Charts for this purpose dealing with Ankylostomiasis can be had from the International Health Commission at Washington, D. C. Through it also can be purchased a variety of magic-lantern slides dealing with the same subject, which can be used to advantage in night lectures.

[2] The half-tones suitable for illustrations may be secured through the offices of the Commission.

Each group of census-takers consisted of three people. Two of these went together from house to house, recording names and personal history, inspecting latrines, numbering the houses, and delivering to each individual a properly marked tin container,[1] requesting that a small portion of the feces should be placed therein. On the following day the third man of the group called to collect these specimens and to take them to the central office for microscopic examination.

We found that it is best in the villages to take the houses street by street, numbering them consecutively, for which purpose a heavy red oil crayon answers admirably. Form No. 1 in the Appendix shows a sample page of the field census-book used in British Guiana. These books provide for 200 names, approximately one day's work in census-taking. This arrangement allows the book to be handed in complete at the end of each day to be recorded, and also makes the names at once available for the use of the collector in gathering specimens for examination.

Each day after the containers had been given out, the collectors in our work in British Guiana were able to secure about ⅘ of the desired specimens due. They were required to keep a list of the remaining ⅕ who were delinquent, and to call from time to time until specimens were obtained from every individual.

4. MICROSCOPIC EXAMINATION.

After the specimens of feces had been collected by the third man in the census group and had been brought to the dispensary, they were assorted with reference to the several villages from which they had been brought and were then ready for microscopic examination. The microscopist was required to record the data appearing on the paper cover of each box before removing the cover, thus preventing confusion. The form used for the microscopical record sheet is shown in the Appendix.

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[1] A one-fourth ounce container with paper inserted in the lid may be had from the Myers Manufacturing Company, Camden, N. J., U. S. A. They are inexpensive and in general use for this purpose.

The method of examination used in British Guiana and recommended is that detailed in Dock and Bass *Hookworm Disease*, pages 158–161. Briefly stated, it is as follows:

One- by three-inch slides were used. Place two or three drops of water in the center of the slide and with a wooden toothpick take up a quantity of feces about the size of the head of a match. Stir this into the water on the slides until it is cloudy, spreading out the diluted feces over the surface of the slide at the same time Care should be taken not to get the mixture too thick to allow rapid examination and clear outlines. Should the first slide prove negative another is prepared in the same way. No examination is recorded as negative until three slides have been examined, all failing to show the presence of the Ankylostoma ova.

No cover glass is necessary. Only wet preparations should be examined. A properly prepared specimen can be gone over thoroughly before drying out. The two-third objective and 1″ eye-piece, or the 16 millimeter objective and corresponding eye-piece will give the proper magnification of about 100 diameters. It is well to have the one-sixth objective also for demonstration and differentiation of doubtful ova. The mechanical stage is not essential and not commonly in use in the work in the United States. That degree of skill is readily acquired which enable the microscopist to manipulate the slide with the fingers. When this method of examination is used more than 100 people can be examined daily by each microscopist.

Recently there has been put upon the market by Bausch and Lomb, of Rochester, New York, a specially constructed centrifuge[1] which greatly simplifies the work of the microscopist and at the same time secures greater accuracy. This is a hand-drive machine with a Stewart Pan-Head carrying 20 tubes. These tubes are of glass, open at both ends, providing for the use of ordinary corks of the proper size. A piece of the feces about the size of a bean is placed in an ordinary test tube and agitated with sufficient water. When in solution this is strained through coarse gauze into the centrifuge tube in order to remove large debris. The centrifuge tube is then corked and placed in position. Gummed labels are used on both the flat bottom and centrifuge tubes, with numbers corresponding to the numbers given to the names of the individuals on the record sheets, thus avoiding danger of confusing specimens. The tubes and funnels are easily boiled and the corks discarded after use. After the specimen is centrifuged all suspended debris (including all ova) is found deposited on the cork at the outer end of the tube. This is removed and the deposit is smeared on a 2 x 3" slide on which have been previously placed several drops of water. This mixture is uniformly spread over the surface of the slide and examined and with a two-third objective and 1" eyepiece without cover glass or mechanical stage. The process is rapid and is facilitated by having one or two cheap employees in the central office to do the centrifuging.

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[1] Since these special centrifuges and supplies are not yet listed in the catalogues, a descriptive list will be found in the Appendix.

When the centrifuge is not used, it has been customary, as we have seen, to examine three slides, before recording negative results. It is only necessary to examine one slide, however, with the centrifuge method and more accurate results are obtained. Especially is the use of the centrifuge valuable in the re-examinations after treatment, where the eggs are often reduced to the minimum.

The method adopted in British Guiana, of cleaning the microscope slides after use, was simple, time-saving, and effective. Immediately after use they were dropped into a bowl containing a strong solution of Jeyes Fluid or Lysol. At the close of the day's work they were stirred about in this bowl until all particles of fecal matter were detached; then they were removed, thoroughly rinsed through several waters, and wiped dry. The tin containers and toothpicks were, of course, discarded after use.

In British Guiana, in a district of 14,000 inhabitants, three young East Indians were found sufficient to do the microscopical work. Previous experience with the microscope was not found to be essential. After several weeks of training these men were examining from 100 to 125 specimens daily, and this number should be materially increased with further experience.

5. TREATMENT.

The purpose of the campaign in British Guiana was primarily, of course, to eradicate Ankylostomiasis, but in doing this we were to test two methods of administering the thymol:

1. The "Daily" method, which had been successfully used by Dr. J. E. A. Ferguson in treating the indentured East Indian laborers on the sugar estates of Peter's Hall District; and,

2. The "Intensive" method, which had been used almost exclusively in the United States, in the extensive campaign waged against Hookworm Disease in the Southern States.

The "Daily" method of treatment, as it was employed in British Guiana, required that the adult patient be given 10 grains of thymol each day, except Sunday, for four months, or approximately 100 doses. No purgative was necessary and no modification of diet or habits was required, except abstention from alcoholics for a few hours after the thymol was taken.

As rapidly as the villages in Area B—five in number—could be examined microscopically, those found infected were placed on the "Daily" treatment. This Area had a population of 3,563, of whom 3,207 were examined, showing 1,918 to be infected with Ankylostomiasis.

The thymol-distributors were accompanied by the Supervising Medical Officer on their first visit to each patient, and, later, certain days were appointed for each village when he visited all malcontents and could be consulted by the patients. This practice established a bond of sympathy and understanding between the Medical Officer and the people, which insured more perfect co-operation throughout the campaign.

It was not found difficult to induce most of those infected to begin treatment. Many of them were eagerly responsive to the idea of "getting something for nothing," and all seemed to covet the little cards, or "Certificates of Health," which were issued to those not infected with Ankylostomiasis, and promised to those who would persist in the treatment until cured.

Of the several elements of population dealt with, the East Indians, who compose approximately half of the population, were the most docile and easily managed.

The fact that this method of treatment did not require the patient to make any sacrifice in diet, or habits, was a persuasive talking-point in inducing the infected to begin treatment, but this advantage was more than lost when it was learned that a dose of thymol was to be given them daily for the long period of four months. It was from the prolongation of treatment that most of our difficulties with this method arose. A considerable number became tired of the daily dose and were inclined to abandon treatment, the improvement in physical condition being so slow that it was often not recognized sufficiently to encourage them to continue. During the period of four months there were often interruptions in the course of treatment by unavoidable circumstances—absence from home, intercurrent illness, etc.—and since its efficacy seems to depend largely upon its regularity, this added to the difficulties.

The rather elaborate force required for the distribution of the daily doses of thymol—one distributor to each 200 patients—made it necessary to recruit this force from a low-salaried source—$8.00 to $10.00 per month—and it was very difficult to secure trustworthy people at this price.

The constant demand made upon the time of the Supervising Medical Officer to see the dissatisfied and persuade them to continue the treatment was so heavy that it would materially limit the Area or population which could be handled by one such officer.

After the treatment was well under way, in Area B., the Village of Meadow Bank was selected and placed under treatment by the "Intensive" method.

This village, with a population of 520, had an infection of 52¾ per cent or 275. The "Intensive" method of treatment, as employed here, provides that the adult be given 40 to 60 grains of powdered thymol on one day in each week until cured. This dose of thymol is preceded and followed by an active saline purgative, and the patient is required to abstain from food for at least 18 hours during the treatment. It has been found that better results are obtained if the thymol is finely powdered and triturated with from ½ to an equal quantity of sugar of milk, and given in a cachet or gelatin capsule. It may be of interest to give in detail the method used in administering the thymol by the intensive method.

DIRECTIONS.

1. On the day preceding the treatment give a large dose of sulphate of magnesia at 5 p. m. No supper should be eaten. The saline should thoroughly empty the alimentary canal.
2. Remain in bed the following morning without food.
3. At 6 a. m., take one-half of the thymol; at 8 a. m., take the remainder.

4. Take a large dose of sulphate of magnesia at 11 a. m. This should be repeated if a thorough movement of the bowels is not secured within two hours.

5. No food should be taken until after the bowels have moved thoroughly, and then no greasy foods, milk, alcoholics or malt drinks should be indulged in.

6. The usual diet and habits may be resumed on the day following treatment.

7. If the patient feels weak or dizzy during the treatment give one-half cup of strong coffee without sugar or milk.

8. Careful examination of the dejecta from the second dose of sulphate of magnesia should show the dead worms expelled.

9. Several of these courses of thymol given at weekly intervals are usually necessary for cure. (See form of printed directions in Appendix.)

There is a scientific reason behind each step of the treatment as detailed by these directions, which must be evident to the mind of the medical man who is familiar with the disease. Since Ankylostomiasis is a disease which will not yield to haphazard medication, many cases proving obstinate under any methods of treatment, and since thymol is a drug which must be given under certain restrictions in order to be safe and efficient, it is well to have definite directions to follow in its administration.

More than 50 per cent of our cases were cured in British Guiana with two treatments, or in eight days after the first examination. A very small per cent required more than three treatments. Almost any person who is convinced that the Ankylostome is present in his or her body will readily consent to give one day out of each week for two or three weeks to be cured of this malady. Thousands of working-people, miners, carpenters, farmers, and clerks, have been treated on Sundays, thus losing no time from their labors.

It has been repeatedly stated that the above-mentioned dose of thymol is "dangerous." In reply to this I will point to the fact that more than a million maximum doses of thymol have been administered in the United States to persons of every age, color, race, and physical condition, and that most of these treatments were taken by the patients in their own homes without supervision from nurse or physician, and yet without a fatality, or serious physical disturbance, except in a very limited number of cases where the patients indulged in alcoholic drinks with the thymol still in the intestinal canal.

Further, it is evident that in a large number of cases the thymol was incorrectly taken, for many of these people were illiterate and densely ignorant. I fancy there are but few drugs in the Pharmacopoeia which could stand so severe a test, and still be considered comparatively safe.

At the end of this chapter is given a complete report of the campaign in Meadow Bank with the "Intensive" method, and a partial report from Agricola village, where the campaign with the "Daily" method of treatment is drawing to a close.

Our experience in British Guiana with the two methods of treatment demonstrates the fact that—

1. The "Intensive" treatment presents less difficulty as an administrative problem.
2. It cures a larger percentage of those infected.
3. These cures are secured at a smaller per capita cost.

For the foregoing reasons only the patients in the first Area of Peter's Hall District will be treated by the "Daily" method, in all other Areas the "Intensive" treatment will be employed.

From Report of August 15, 1914.

	Agricola.	Meadow Bank.
Method of treatment used	Daily.	Intensive.
Duration of campaign	[1]3½ months.	[2]2 months.
Population examined	1,210	520
Number infected with Ankylostomes	635 (52%)	275 (52¾%)
Number beginning treatment	[3]620	211
Number refusing treatment without cause	(3)	7
Number to whom treatment was refused for medical reasons	(3)	[4]15
Number abandoning treatment, some remaining and others removing	78 (11%)	2 (less than 1%).
Number removing before treatment started	(3)	[5]34
Number remaining to be treated	(3)	240
Number died (not associated with administration of thymol)	2	1
Number cured	303 (49%)	209 (87¾%)
Under treatment	236	0
Unaccounted for	0	7

[1] Campaign not complete. [2] Campaign complete. [3] Figures not available, or not verified. [4] For medical reasons: pregnancy, 8; lunacy 3; chronic dysentery, 1; chronic diarrhoea and "old age," 2; biliary cirrhosis, 1. [5] These removals were due in the main to the rigid enforcement of sanitary regulations.

The campaign was unduly prolonged by church festivals and sanitary work in progress in the village.

6. RE-EXAMINATION.

As complete eradication aims at writing "*cured*" after the name of every infected individual in the Area of Operation, re-examination after treatment to ascertain who are "cured" is an important step in the campaign, and the methods used should be such as to insure unquestioned accuracy in the results. Our experience in British Guiana shows that certain general, but none the less essential, rules should be followed:

1. No negative results, or "cures," were accepted as such unless the specimen of feces was secured at least six days after the last dose of thymol was given to the patient. This precaution is rendered necessary from the fact that the toxic effect of the thymol on the female Ankylostome continues for some days after its administration to the host, during which time the absence of ova will be misleading. This applies to the use of the small daily dose as well as the much larger dose of thymol used in the "Intensive" treatment. The use of a specially constructed centrifuge accomodating twenty specimens, and operated by hand, which can be had in the American markets, will greatly facilitate this state of the work.
2. Re-examinations with the daily small dose method were made at the end of the third month, and monthly thereafter until negative results were obtained. Each time the patient was required to omit the thymol a week prior to examination.
3. Re-examinations with the "Intensive" method of treatment were made on the sixth day after the second weekly treatment, and weekly thereafter until the patient was cured. This arrangement permits the patient to have treatment on the same day of each week, and yet allows a sufficient interval between the examination and the last dose of thymol.
4. It is recognized that there is a possibility of error in a small percentage of cases if the negative results of one examination are accepted as final. This possibility of error arises from the fact that, while the feces of a patient may show no ova at the time of examination, there can be numerous Ankylostome embryos in the tissues of the body, en route to the intestinal canal, as a result of a recent skin infection. Some weeks must elapse before these worms can reach the intestinal canal, grow to adult size, and begin to ovulate. Only repeated examinations, at intervals, as long as there is possibility of infection, will eliminate these cases.

It is obvious to anyone with laboratory experience that the use of the centrifuge will secure much more accurate results than those reached without it, and this is especially true in cases of mild infection, and partially cured cases met with in re-examination, where the numbers of ova are reduced to a minimum. Centrifuges operated by hand are usually constructed to handle 2 or 4 specimens, with tubes of such shape as to render it difficult to sterilize them. To attempt to use an instrument of this type means a great loss of time. It was to meet our needs that the specially constructed centrifuge mentioned in a preceding chapter (6. Microscopic Examinations, page 9), was offered.

This instrument accommodates 20 specimens. The tubes are plain glass, open at both ends, and can be quickly sterilized by boiling. Its use not only secures greater accuracy, but also greater speed in making the examinations.

7. WORKING FORCE.

In the beginning of the work in Peter's Hall District the force consisted of one Black, who had some training in sanitation, and the Representative of the International Health Commission. There were no additions made to the force until the publicity work was done, when there were added two young East Indians as Microscopists, and a colored man as Pioneer. With these additions, the taking of the census began. Thus at each successive step of the campaign the force was developed and added to, and methods carefully tested out, until we recognized a definite personnel adapted to a definite programme, and able to carry it out economically, thoroughly, quickly, and efficiently. The following statement indicates the force employed for Peter's Hall Medical District:

One Supervising Medical Officer, salary $1,600.00; one Chief Clerk, salary $65.00 to $80.00 per month; one assistant Clerk, salary $20.00 to $30.00 per month; three Pioneers, salary $15.00 to $20.00 per month, each.

To each 1,200 inhabitants: one Male Nurse, salary $30.00 to $40.00 per month; one Assistant Nurse, salary $8.00 to $12.00 per month.

To every 4,000 or 5,000 inhabitants: One Microscopist, salary $20.00 to $30.00 per month.

The male nurse referred to above was usually an East Indian or Black who had seen service either in the Government Hospitals or those of the sugar estates. Whenever possible, these men were secured in the district where they were to work. Their service in the hospitals had given them a certain amount of prestige in the minds of the people, who readily accepted their services in giving the thymol treatment. The nurse and his assistant took the census in the beginning of the work, and collected the specimens of feces for examination.

When the time came for giving the treatment the nurse and his assistant were furnished with a treatment book (see form in Appendix), in which were recorded the names of all who had Ankylostomiasis. These people were seen in their homes, and arrangements were made with each individual as to the day of the week on which he or she preferred to take treatment. It was found that a nurse could handle about 50 cases each day, and his assistant the same.

These men called at the homes of the patients on the afternoon of the day before the treatment, administered the preliminary purge, and gave directions about fasting, etc. On the following morning they went from house to house, giving the thymol and keeping the patients under observation. At 11 a. m. they gave to each patient the last saline purge and saw that it acted thoroughly before they allowed the patient to eat or to leave his premises.

One week later the patients received their second treatment, given in the same way, and each successive week until cured. The nurse and his assistant are expected to secure specimens for re-examination from patients who have had two treatments, at least six days after the last treatment, and to bring them into the office weekly thereafter until they are found cured. This phase of the work must be watched carefully to prevent confusion.

Should the "Daily" method of treatment be used, some changes in the above-mentioned force would be necessary.

The Medical Officer, Chief Clerk, Assistant Clerk, and Microscopist would remain the same, but there would be a Pioneer to each 3,500 inhabitants, and a Distributor of thymol to each 200 infected cases. These Distributors may be had at an average salary of $8.00 to $10.00 per month.

8. FINANCIAL PROCEDURE.

1. Following the visit of Mr. Wickliffe Rose, Director-General of the International Health Commission to British Guiana, in the autumn of 1913, on which occasion offers of assistance in the eradication of Ankylostomiasis were made to that Colony, a budget was prepared by the Surgeon-General providing for

eradication work in a definite territory—Peter's Hall District—during one year. This budget was submitted to the International Health Commission, and adopted. Following their approval of the budget, that portion of the funds to be furnished by them was paid through the Receiver-General into the Government treasury in quarterly installments, and disbursed through the same channels, and under the same restrictions as control Government expenditures.

2. It was understood that these funds were to be made available by submitting to the Surgeon-General of the Colony a written and itemized requisition, signed by the Supervising Medical Officer of the Eradication Campaign, and the Government Medical Officer of the District where operations were in progress. These requisitions were countersigned by the Surgeon-General and forwarded to the Treasury, where payment was made at the end of each month. The same procedure applied to all invoices and itemized bills.

3. It was agreed that all vouchers should be made out in triplicate, so that a copy might be supplied to the Receiver-General, the Treasury Department, and the International Health Commission.

4. A copy of the budget under which he was operating was supplied to the Supervising Medical Officer and it was agreed that, at all times, expenditures must be kept within the amounts allotted to each head or item of the budget.

5. A separate account was kept for each budget in operation, both by the Surgeon-General's office and by the Chief Clerk of the force.

6. At the month's end a statement of expenditures under each budget was prepared by the Chief Clerk and compared with the accounts being kept in the Surgeon-General's office.

7. A Quarterly Report of Expenditures in each area was prepared in the Surgeon-General's office and sent to the International Health Commission, together with the usual Quarterly Report of work done.

8. It was agreed that a report of the auditing of the funds furnished by the International Health Commission should be sent them from the Auditing Department of the Government semi-annually.

9. DURATION OF CAMPAIGN.

With the "Intensive" method of treatment 50 per cent of the cases treated in Meadow Bank Village, British Guiana, were cured in two weeks; that is, they were examined, found to be infected and given the first treatment at once; a week later they were given the second treatment; and six days later they were re-examined and found cured. 35 per cent were cured with three treatments, which required three weeks; and 15 per cent required from four to six treatments, consuming a maximum time of six weeks. In actual experience all infected cases in a given territory can not be put on treatment simultaneously. With the force provided for in the preceding pages, making due allowance for contingencies, the campaign in a given territory should be completed in four months from its inauguration, whenever the "Intensive" method of treatment is used. The campaign in Meadow Bank Village was completed in two months, from which fact it may be seen that the above estimate allows for twice the time required in actual experience.

With the "Daily" method, four months are required for the treatment of the individual case. Recent reports from British Guiana indicate that 50 per cent are cured in three months; but we can not yet be certain how long it may take to cure the remaining 50 per cent. Present information indicates strongly that the campaign in Area B, Peter's Hall District, where the "Daily" method of treatment is being used with 1,800 cases, will be completed on December 31, 1914, or 8 months from its inauguration. It is probably safe to estimate that, under average conditions, with the use of the "Daily" method of treatment, a campaign in a given territory will require from 8 to 12 months.

10. SANITARY MEASURES FOR PREVENTION.

The International Health Commission undertook in Peter's Hall District, British Guiana, to locate and cure, as far as was possible, every person affected with Ankylostomiasis, and to educate the people, with literature and illustrated lectures, in Modern Sanitation and preventive measures. In this work they were to have the support and co-operation of the Government, which would undertake to inaugurate such sanitary changes and improvements in the District as would reduce the dangers of re-infection to a minimum.

As the whole question of the prevention of the spread of Ankylostomiasis is simply a question of preventing the ovaimpregnated feces from being deposited on the surface of the ground, where, in the presence of moisture and oxygen the eggs will hatch into the infective embryos, our attention was naturally centered on the privies or latrines in use in this District. There were three types in use. Many of the homes[1] in the village were found unprovided with latrines of any sort, but the cane patches and the "Bush" were used instead as places of concealment. Others[2] had latrines which were for concealment only, as all night-soil fell upon the surface of the ground, to be scattered about by fowls, beating rain, etc.

On the sugar estates the latrines[3] in common use by the indentured labor are built of sheet-iron, except the floors and frames, and located over the "drainage trenches." All dejecta fall into the trenches, and as long as the water therein stands at its normal height these latrines largely prevent Ankylostomiasis infection. It often occurs, however, that the water level recedes, exposing areas of mud-bottom contaminated with viable Ankylostome eggs, and other pathogenic organisms too numerous to mention; and when children and others wade into and across these infected spots, they cannot well avoid contracting a case of Ankylostome "ground itch."

The third type of latrine was the so-called "Pit Privy," in common use in the United States, and by far the most effective of the three.

These privies are constructed as follows: A pit of proper dimensions, and three to four feet deep is dug. Over this pit are placed the seat and light superstructure so that all night-soil falls directly into the pit. The earth is banked up around the lower edges of the latrine walls to keep out water. The seat should have a cover which will only stay up when occupied.

When the pit becomes filled with night-soil to within a foot or so of the top, another pit is dug near by, and the seat and superstructure are moved over it, the old pit being filled up with earth.

This latrine is inexpensive, it does not require cleaning, can easily be made fly-proof, and prevents the spread of disease-breeding filth. With its construction and general use the spread of Ankylostomiasis will be checked, typhoid will become rare, and bowel-disorders will become less frequent.

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[1] These homes are indicated on our sanitary report sheet as F types.

[2] These are designated as Type E in our sanitary sheets.

[3] This type of latrine is classified as D type on our weekly report sheets.

The improvement in sanitary condition by the Government force has kept pace with the progress of the curative measures of our campaign in British Guiana.

Latrines of either the trench- or pit-type have been put in by the people at practically every home in Area B, and steps are being taken to secure like results in the other Areas.

The existence of compulsory laws has made it possible to secure very prompt action in the District on Sanitary matters.

11. PER CAPITA COST.

In estimating the per capita cost of a campaign for the complete eradication of Ankylostomiasis, we are unfortunate in not having a full report of a campaign dealing with a large area. From such a report definite data could be obtained. The campaign in Peter's Hall District, British Guiana, however, does afford us complete returns from a small area, and partial returns from a larger area, and it is possible by basing our estimates upon these to arrive at results accurate enough for all practical purposes.

For our purpose here we will take the "Unit of Area of Opertion," a medical district, with a population of 15,000 and an infection of 50 per cent, and arrange a definite budget for this area.

BUDGET.

RUNNING EXPENSES.

Medical district, population, 15,000; infection 50%, 7,500 to be treated; duration of campaign, four or six months; method of treatment, "Intensive."

Force and salaries.	Monthly.	Four months.	Six months.
1 Supervising medical officer	$150.00	$600.00	$900.00
House allowance	20.00	80.00	120.00
Travelling allowance, limited to	50.00	200.00	300.00
1 Chief clerk, salary	80.00	320.00	480.00
1 Assistant clerk, salary	25.00	100.00	150.00
3 Microscopists, at $30 per month	90.00	360.00	540.00
3 Pioneers, at $18 per month	54.00	216.00	324.00
6 Nurses, at $30 per month	180.00	720.00	1,080.00
6 Assistant nurses, at $10 per month	60.00	240.00	360.00
3 Caretakers for office, at $5 per month	15.00	60.00	90.00
3 Offices, at $6 per month	18.00	72.00	108.00
Contingent expenses for three offices, at $10 per month	30.00	120.00	180.00
Totals of running expenses	772.00	3,088.00	4,632.00
Rate, per capita, 7,500 people to be treated	$0.103	$0.412	$0.616
Rate, per capita, 15,000 people to be examined	.052	.207	.309

FIXED EXPENSES.

Furniture and utensils for three offices.	
9 tables, 18 chairs, 6 benches, water cooler, towels, etc	$150.00
Additional for central office.	
Typewriter, $80.00; locked press for record books, microscopes, supplies, etc, $20.00	100.00
Scientific supplies.	
3 microscopes at $35.00, Bausch & Lomb, Rochester, N. Y. (special)	105.00
Microscope slides	10.00
1 Balopticon and tank, $35.00, Bausch & Lomb, Rochester, N. Y.	35.00
50 Balopticon slides on Ankylostomiasis, P. M. Foltz, Washington, D. C.	15.00
1 Hook worm chart	5.00
1 Centrifuge (special), Bausch & Lomb, Rochester, N. Y.	15.00
Accessories for same	5.00
1 Kodak or camera	25.00
Printing: Record books, report sheets, literature, etc.	300.00
Tin specimen containers, Myers Mfg. Co., Camden, N. J. (150 gross)	75.00
Thymol, 180,000 5-grain capsules, average 24 capsules to case treated, $2.50 per 1,000	450.00
Sulphate of magnesia	75.00
Total	$1,365.00
Rate per capita for 7,500 individuals treated	$0.182
Rate per capita for 15,000 individuals examined	.091

In a four months' campaign Running Expenses give a per capita cost of $.412 for cases treated. Add to this $.182, the per capita cost of cases treated for fixed items of budget shown above, and we have a total per capita cost for cases treated during a four months' campaign of $.594. A six months' campaign would increase this to $.798.

12. IS COMPLETE ERADICATION POSSIBLE?

There is probably no disease, certainly no other parasitic disease, of which our knowledge is so complete as it is of Ankylostomiasis, and for which we have two or more specific drugs. There is not a missing link in our knowledge of the Ankylostome, from the moment the egg reaches the soil in the feces of its host and hatches into the embryo; throughout all the stages of development until, in its "encysted" stage, it enters the human body, to reach finally the small intestine, there to live for eight or ten years, reproducing its kind in countless thousands. Every detail of its life-history and the necessary environments for its development are points rendered very familiar by the researches of the scientists.

With such perfect knowledge, then, it has been an easy task to elaborate a perfect theory for the prevention of the disease. Only one thing is necessary; that is, to prevent soil-pollution, in other words, to keep the Ankylostome ova from reaching the soil where it could hatch and develop into the infective embryo.

If those who have the disease can be cured, and we know how to prevent others from contracting it, then complete eradication is at least theoretically possible.

Let us consider briefly what are the necessary steps to accomplish complete eradication.

1. The microscopic examination of every individual in the field of operation.

2. The treatment of every infected individual until cured.

3. The installation and use of proper closets or latrines, preventing further "soil-pollution."

4. The protection of the people against infection by Ankylostome embryos already in the soil.

Although the problem of complete eradication seems simple, when thus put upon paper, it is not found so when actually attempted, for many difficulties develop. Every difficulty, however, can be rightly attributed to one cause, "lack of adequate co-operation on the part of the people." This lack of co-operation was evident from the first day of our campaign until its close, and since human nature is much the same the world over, this will probably be true in some measure, no matter where the campaign be waged.

Taking up the four essential steps to complete eradication, let us briefly note some of the difficulties which make against complete success:

1. The microscopic examination of every individual in a given area of any extent has never been possible, in the experience of the writer. There have always been those—few though they may be—who refuse to submit specimens for examination. Widely varying reasons are advanced by these people for their failure to co-operate, and it may be of interest to mention those most frequently met with in Peter's Hall District.

(*a*) A false sense of modesty prevented some from preparing and submitting specimens.

(*b*) People of apparent good health, though they might have mild infections, did not feel the need of examination and treatment.

(*c*) Among the illiterate class unreasonable suspicion and superstition deterred some.

(*d*) Others because of social prominence, intellectual attainments, or wealth, seemed to consider themselves immune to the disease.

(*e*) There were some who were openly hostile, seeming to see in the campaign an attempt to interfere with their personal liberties.

(*f*) The indifferent and negligent class furnished its usual quota of incorrigibles.

The following extracts from the reports of Peter's Hall District for August 15, 1914, show the number refusing examination:

Population of Area B, Peter's Hall District, as shown by actual census taken by staff of International Health Commission....	3,563
Number examined for Ankylostomes by the staff of the International Health Commission in Area B....................	3,207
Number refusing examination, some removing from area, and others remaining as possible foci of infection (10% of the population)..	356
In Meadow Bank village, Area A, population as shown by census..	520
Examined..	467
Number refusing examination or removing from village (approximately 10%)..	53

2. The treatment of every individual affected with Ankylostomiasis, until cured, depends upon the willingness of the patients to take the treatment for a sufficient length of time. Here, as in the question of microscopic examination, there are a small number who persist in refusing treatment, even though shown that they harbor the parasite.

There are others who abandon the treatment short of a complete cure, and a small number who are refused treatment for medical reasons, thymol being contra-indicated because of intercurrent diseases.

The number that refuse or abandon treatment is usually smaller than the number refusing examination, as is shown by the following figures taken from the reports from British Guiana:

Agricola, Peter's Hall District.[1]

Positive cases reported July 20................................		619
Number starting treatment..........................	619	
Number cured....................................	311	
Number under treatment............................	239	
Number abandoning treatment (11%).................	69	
Number refusing treatment (not reported)..............	...	

Meadow Bank, Area A, Peter's Hall District.

Number positive cases reported................................			275
Number starting treatment..........................		211	
Number reported cured..............................		209	
Number abandoning treatment	3.4%	2	
Number refusing treatment		7	

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[1] Campaign not yet completed.

The difference between the number found positive and the number treated and cured will vary in proportion as the Supervising Medical Officer is patient, persistent, and tactful, or otherwise.

3. The installation of sanitary closets or latrines is possible, as has been demonstrated in parts of Peter's Hall District and elsewhere. Compulsory laws with penalties, if enforced, will secure results, but better, and much more to be desired, are the results obtained by a campaign of education and enlightenment, which creates a public demand for such improvements. After such closets are installed, we still face the difficulty of securing their use by the people. This is not in my opinion, however, the hopeless task that some have expressed it to be. In Peter's Hall District, with its mixed population, consisting largely of ignorant Blacks and East Indians, the patient, tactful, and yet firm handling of this question brought really remarkable results.

4. Efforts to protect the people from infection from the already existing Ankylostomes in the soil are possibly less promising of success than any other feature of eradication.

Because of the labor involved it is often impracticable to attempt to locate areas where the soil is infected with the Ankylostome ova and embryos. If such areas were located they would probably be too extensive to make their destruction possible, or to keep the people away from these infective points.

Attempts at the destruction of the Ankylostome ova and embryos in the soil by the use of chemicals have not been entirely satisfactory. In a paper read before the Society of Tropical Medicine and Hygiene, by Sir Thomas Olliver, in 1910, the statement is made that "The one salt which has given the most satisfactory results all around is Iron Sulphate. It is estimated that one ton of this in a 1 per cent solution would cover a length of 60 miles, more than a yard wide, and one-third of an inch deep." This solution was used to a limited extent in Peter's Hall District, and brush and trash piles were burned on spots likely to be heavily infected, such as sites of surface closets, stooling-places in thickets, and in cane-fields, etc.

It is possible to meet the difficulties presented by this fourth and last essential to complete eradication by keeping the entire population under observation until sufficient time has elapsed for all Ankylostome embryos in the soil to die, probably about ten months; or to arrange a return campaign, when cases resulting from re-infection from this source may be found and cured.

Summing up the situation, we may say that while the complete eradication of Ankylostomiasis in a given territory is theoretically possible, practically it can only be approximated.

What, then, are the results and benefits of a properly conducted campaign of this nature?

1. Approximate eradication is obtainable. How nearly eradication was approximated in British Guiana is indicated by complete returns from one village and partial returns from another.

Report from Meadow Bank village, Peter's Hall District, August 15, 1914:

"Of the 233 positive cases remaining in Meadow Bank village at the close of the two months' campaign, 209 were cured. The 24 not treated are reported as follows:

7 refusing treatment. 2 abandoning treatment.

15 were refused treatment because of pregnancy, or intercurrent diseases contra-indicating the use of thymol.

Percentage cured, 90."

In Agricola village the campaign is not yet completed, but of the 619 cases beginning treatment, 311 are reported cured, and 239 are continuing treatment with prospect of early cures in practically all of this number.

We see from these reports that these campaigns mean the cure of a large percentage of those affected with Ankylostomiasis. In Peter's Hall District it means the restoration to health and happiness of hundreds of severe cases, of all ages, and degrees of infection ranging from physical unfitness to labor and consequent poverty and want, to advanced bed-ridden invalidism. Scores of children, whose mental and physical development were endangered, will be free from the disease and restored to their natural heritage of buoyant health and vitality. It means the relieving of the mothers of the District from the dangers of a disease which during pregnancy and at childbirth has enormously increased the maternal death-rate.

2. As a result of our campaign the increased activity of the sanitary authorities, together with the awakened interest of the people in improving sanitary conditions, have brought results which will lead to a marked decrease in Typhoid, Dysentery, Diarrhoea, and kindred troubles.

3. The campaign was, in this instance, as it generally is, a "pioneer movement," and "blazed out" and made easy the way for other crusades against preventable diseases which the future necessarily will bring.

4. If the following efforts be steadily continued—

(*a*) To improve sanitation and stop soil-pollution;

(*b*) To educate the people concerning the cause and prevention of the disease;

(*c*) To provide, after the close of the campaign, for the free treatment of all cases of Ankylostomiasis,

then it would seem reasonable to hope for eventual eradication, an end probably not attainable save by aiming at and striving for complete eradication during the initial campaign in any given community.

APPENDIX

Forms and Financial Regulations

APPENDIX.

WEEKLY REPORT. **District,..............................**

CENSUS, SANITARY SURVEY, EDUCATIONAL.

..............................*Dispensary for Week Ending*..............................*19*.....

Location.	H. No.	Individuals.	Latrines. Class.				Date.	REMARKS.
			D	E	F	Total.		
Totals ...								

(Size of form 12½" x 8")

EDUCATIONAL. **LITERATURE DISTRIBUTED.**

DATE.	Lectures.		By Whom	Locality.	No. Attend	Date.	Locality	Circulars.	Sheets	Others.
	Day	Night.								

Signed..

Form A.

Hook Worm Eradication Dispensary. LOCATION,

NAME.	AGE.	SEX.	RACE.	HOME No	AREA.	LATRINE.			REMARKS.
						D.	E.	F.	

(Form for field census book used by the census takers. These books are arranged to accommodate 200 names which will be found to be a day's work for the census takers. This form permits of the use of one book for each day, so that the record of each day's work can be filed in the office for reference. In the classification of latrines (see above D.E.F.), the drainage trench and pit latrines in good order are classed as D latrines. Those serving only for concealment and permitting unrestricted soil pollution are classed as E. Homes, schools, public buildings not provided with latrines are classed as F.)

(Size of form 5" x 8")

District.____________________

REPORT OF MICROSCOPISTS.

Area.____________________

____________________*Dispensary for Week Ending*____________________*191*

Date. Monday.	Locality.	No. Examined	A.D.	A.L.	T.D	Rh. I.	O.V?	T.S.	T.N.	
Tuesday.	TOTALS									
Wednesday.	TOTALS									

(Each sheet of this form provides for the recording of the microscopical work done at 6 different points in a district and on the 6 days of the week. All of this work is supposed to be done at the central office dispensary.)
(Size of form 8" x 13")

Thursday.	TOTALS									
Friday.	TOTALS									
Saturday.	TOTALS									
	TOTALS									

*Signed*______________________________*191*

INFECTION SURVEY.

DISPENSARY FOR FREE TREATMENT OF ANKYLOSTOMIASIS.

Report of.. ....Supervising Medical Officer, Week ending............................19

Area.................. ....District............ ....Dispensary at... ....

MICROSCOPICAL EXAMINATIONS AND RESULTS.

Date.	Location.	A.D.		A.L.	T.D.	Rh. I.	O.V.	T.S.	T.N.	REMARKS.
		+	−	+	+	+	+	+	+	
	TOTALS ..									

(Weekly report sheet for use of supervising medical officer)
(Size of form 12½" x 8")

SUMMARY.

No. in Census	....
No. Examined	....
No. Pos. A.D	....
No. Neg. A.D	....
No. Refusing Examination ...	....
No. Absent	....

Signed.. ....

....

CASE RECORD BOOK

Free Treatment of Ankylostomiasis

Census						Examinations												Treatments				
						1st			2nd			3rd			4th			Week Ending		Week Ending		
No.	Name	H. No.	Race	Sex	Age	Date	A.D.	Others	Date	A.D.	Others	Date	A.D.	Others	Date	A.D.	Others	1st Date	2nd Date	1st Date	2nd Date	3rd Date

Treatments											
Week Ending					Week Ending						
1st Date	2nd Date	3rd Date	4th Date	5th Date	1st Date	2nd Date	3rd Date	4th Date	5th Date	6th Date	Remarks

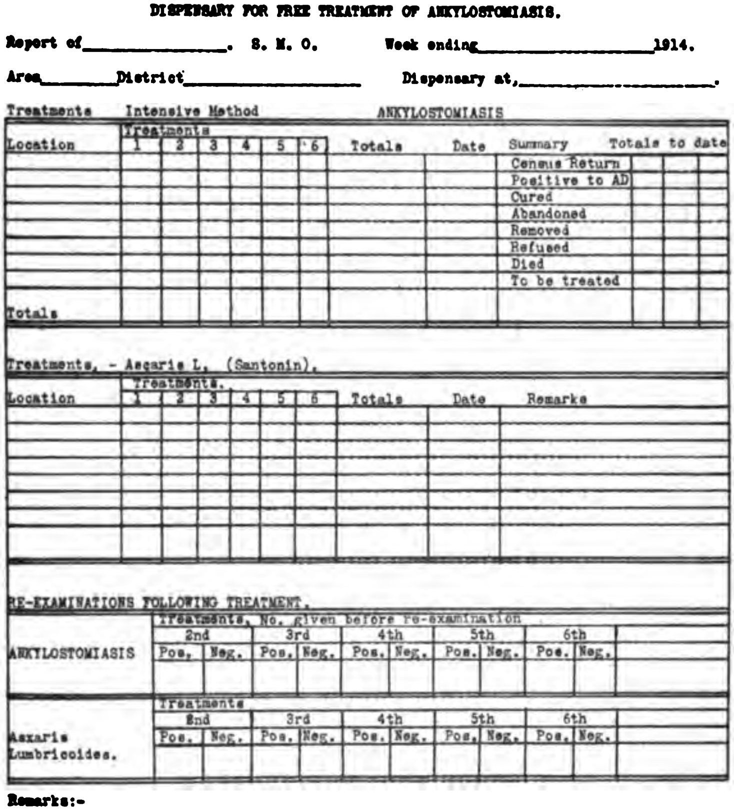
CASE RECORD BOOK.

The form shown above for a Case Record Book provides for all essential facts regarding the campaign of eradication: Census; Patient No., Name, House No., Race, Sex, Age, examination; the date of the first examination, and the results as to A. D. and other parasites; space for 3 re-examinations; dates and results as to A. D. and other parasites. The portion allotted to treatments provides for a period of 12 weeks. If it is thought that the campaign may extend beyond this time, additional short pages may be added to accommodate any period.

These weekly columns are headed, "Week ending ....," the blank to be used for inserting the date of Saturday of each week—the blank in the first column would of course be filled in with the date of Saturday of the first week of treatments, succeeding columns being used for the weeks in order.

The subdivisions of these weekly columns headed, 1st Date, 2d Date, etc., provide for a treatment to be recorded as to its number, whether it is the 1st, 2nd, 3rd, etc., given to that particular individual, and the date upon which it was given. If the numeral indicating the number of grains of thymol given is used in the column of treatment this adds to the value of the record.

Care should be taken to record treatments in the weekly columns corresponding to the dates upon which they are given. When this is done the totals at the bottom of the page of the Case Record Book for each respective week show the treatments given for that week, and from these we can easily make out the Weekly Reports. It may be noted that the first and second weekly columns provide for 1st and 2nd, and 1st, 2nd and 3rd treatments, while all the rest have columns for 6 treatments. As the treatments are given each week, not more than three treatments can be given to any one individual up to the end of the second week. The other columns are arranged for as high as 6th treatment, which is likely as many as will be required to cure most cases. These Case Record Books should be of a size to accommodate about 50 names to the page, and a convenient sized book will contain about 2,500.



DISPENSARY FOR FREE TREATMENT OF ANKYLOSTOMIASIS.

Report of________________. S. M. O. **Week ending____________________1914.**

Area________District____________________ **Dispensary at,____________________.**

Treatments Intensive Method ANKYLOSTOMIASIS

	Treatments										
Location	1	2	3	4	5	6	Totals	Date	Summary	Totals to date		
									Census Return			
									Positive to AD			
									Cured			
									Abandoned			
									Removed			
									Refused			
									Died			
									To be treated			
Totals												

Treatments, - Ascaris L. (Santonin).

	Treatments.								
Location	1	2	3	4	5	6	Totals	Date	Remarks

RE-EXAMINATIONS FOLLOWING TREATMENT.

	Treatments, No. given before re-examination										
	2nd		3rd		4th		5th		6th		
ANKYLOSTOMIASIS	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	

	Treatments										
	2nd		3rd		4th		5th		6th		
Ascaris Lumbricoides.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	

Remarks:-

(Size of form 9-3/4" x 7-3/4")

SUMMARY OF WORK ACCOMPLISHED IN ....

"Previous Reports" cover a period from ____________ to ____________

"Present Reports" cover a period from ____________ to ____________

I. EXAMINATIONS.

	Census	No. Examined	No. Infected
No. in Previous Reports			
No. in Present Reports			
Totals to date			

II. TREATMENTS.

	No. Treated	No. Cured	No. Under Treatment
No. in Previous Reports			
No. in Present Reports			
Totals to date			

III. SANITARY SURVEY.

Latrine Types on 1st Inspection							Types changed on last inspection														
A	B	C	D	E	F	Total	F to A	F to B	F to C	F to D	F to E	E to A	E to B	E to C	E to D	D to A	D to B	D to C	C to A	C to B	B to A

SANITARY INDEX.

Date	First Inspection	Date	Last Inspection

IV. EXPENDITURES.

	Local Funds	Government Funds	I. H. C. Funds
Amt. in Previous Reports			
Amt. in Present Report			
Total.			

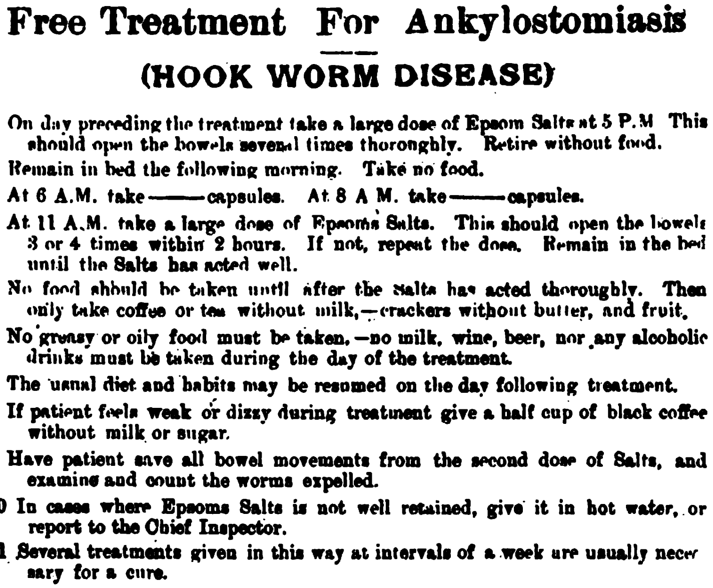
V. BLOOD EXAMINATIONS. HEMOGLOBIN PER CENT.

No. nearest to:	0%	10%	30%	50%	70%	90%	100%	Total
Previous report								
Present report								
Totals								

VI. EDUCATIONAL. LECTURES AND ATTENDANCE

	To Schools	Attendance	To Public	Attendance	Special	Attendance
Previous report						
Present report						
Total.						

(For use in making summaries for any period; also for making quarterly reports)
(Size of form 9-3/4" x 7-3/4)



Free Treatment For Ankylostomiasis

(HOOK WORM DISEASE)

1 On day preceding the treatment take a large dose of Epsom Salts at 5 P.M This should open the bowels several times thoroughly. Retire without food.

2 Remain in bed the following morning. Take no food.

3 At 6 A.M. take——capsules. At 8 A M. take——capsules.

4 At 11 A.M. take a large dose of Epsoms Salts. This should open the bowels 3 or 4 times within 2 hours. If not, repeat the dose. Remain in the bed until the Salts has acted well.

5 No food should be taken until after the Salts has acted thoroughly. Then only take coffee or tea without milk,—crackers without butter, and fruit.

6 No greasy or oily food must be taken,—no milk, wine, beer, nor any alcoholic drinks must be taken during the day of the treatment.

7 The usual diet and habits may be resumed on the day following treatment.

8 If patient feels weak or dizzy during treatment give a half cup of black coffee without milk or sugar.

9 Have patient save all bowel movements from the second dose of Salts, and examine and count the worms expelled.

10 In cases where Epsoms Salts is not well retained, give it in hot water, or report to the Chief Inspector.

11 Several treatments given in this way at intervals of a week are usually necessary for a cure.

(Size of original 4" x 5")

DISTRIBUTION BOOK FOR NURSES.

The Distribution Book for the use of nurses in giving thymol is a reproduction of the first page of the case record book (see form on page 33) except that it provides for 4 weeks and under each week there are 6 treatment columns. These books should be paged to accommodate about 350 names as a nurse can usually handle 50 cases daily, so that this number provides him with sufficient cases for the 7 days of the week.

The card or certificate form shown below was issued to those not found infected, and also to those treated and cured. The word "with" is to be written into the blank preceding the word "treatment" where the patient has been cured, and the word "without" where the first examination showed no infection.

DISPENSARY FOR FREE TREATMENT OF ANKYLOSTOMIASIS.

CERTIFICATE OF HEALTH.

This certifies that....................................

of..........................village, Case No..........

House No.........has been examined and found free from

Hook Worm disease,........................treatment.

Signed,.....................................,
S. M. O.

Date........................

Medical District....................................

SUGGESTED OUTFIT FOR MICROSCOPISTS.

The following is a suggested outfit for use in field work which can be obtained from the Bausch & Lomb Optical Company, Rochester, New York, U. S. A., and probably also from other companies. The approximate cost of this outfit is $20. A larger list of accessories will be necessary where more than one microscopist is to make examinations.

1. Special centrifuge with Stewart Pan-Head for 20 tubes.
2. 100 glass tubes open at both ends, 75 x 9 mm.
3. 100 small funnels for filling tubes.
4. 1,000 corks, xx, Short, No. 0.

SET OF BALOPTICON SLIDES SELECTED BY THE AUTHOR.

Maker's No.	Suggested order for display and description of slides.
308.	1. Eggs of hookworm, diagrammatic.
202.	2. Eggs of hookworm, under microscope.
39.	3. Larvæ of hookworm, two stages of development.
1528.	4. Ground itch, on toes, instep and ankle.
1527.	5. Ground itch, on bottom of foot.
1526.	6. Ground itch, between toes.
743.	7. Ground itch, "bunches" on arm of Cornish miner.
307.	8. Section of skin showing larvæ.
91.	9. Section of lung showing larvæ.
296.	10. Hookworm after reaching intestines.
1081.	11. Hookworm, adult, scale showing size.
1395.	12. Experimental hookworm infection.
1309.	13. Experimental hookworm infection.
1306.	14. Experimental hookworm infection.
1307.	15. Experimental hookworm infection.
1311.	16. Experimental hookworm infection.
72.	17. Hookworm mouth, front view.
66.	18. Hookworm mouth, side view.
118.	19. Hookworm attached to mucosa.
299.	20. Wounded area of intestine.
2613.	21. Lettered slide. "Symptoms."
1540.	22. Two girls with hookworm disease.
359.	23. Entire family with hookworm disease.
1317.	24. Boy with disease, average severity.
1259.	25. Boy with disease, severe type.
1320.	26. Girl with disease, average severity.
2317.	27. Girl with disease, severe type.
2396.	28. Negro boys, brothers.
1501.	29. Two boys, same age (18 yrs.).
358.	30. Boy, 21 years old, dwarfed.
2486.	31. Map, tropical world.
2617.	32. "Beni," first patient treated on foreign soil.
2619.	33. Child, 5 months old with the disease.
2617.	34. East Indian woman, 90 years old.
2624.	35. East Indian girl, severe case.
2611.	36. Vicious circle of hookworm disease.

(A further list of slides may be obtained from Pierre M. Foltz, 302 E St. N. E., Washington, D. C.)

REGULATIONS GOVERNING ACCOUNTING PROCEDURE IN CONNECTION WITH OFFICES OF DIRECTORS IN THE FIELD.

1. *Home office and field office funds.*—Bills due in the United States are to be paid from funds deposited with a bank located in Washington, D. C. and designated by the Commission. Such funds shall be known in the bookkeeping of the Commission as "Home Office Funds."

Bills due in the country in which the office of a director is located or in other countries outside of the United States shall be paid out of funds deposited at the place where the headquarters of the director is located. Such funds shall be known in the bookkeeping of the Commission as "Field Office Funds."

2. *Preparation of vouchers.*—All vouchers shall be prepared in triplicate by use of forms to be provided by the Commission. The three copies will be distinguished by colors as follows: original, white; duplicate, pink; triplicate, primrose.

In making payments out of field office funds the word "home," and in making payments out of home office funds the word "field" should be crossed out on the voucher. The name of the budget should be indicated, together with the budget number. The first budget adopted for a given area or country will be budget No. 1. The second, No. 2, etc. A voucher charged against field office funds under budget No. 2 of Panama would, *e. g.*, bear the words, "Panama No. 2" in the space provided on the voucher. Vouchers should be made out in the currency of the country in which payment is made. Where two standards of currency are in use the one adopted by the government should be accepted by the Commission rather than the one in use by banks and commercial houses.

Vouchers used in countries in which the English language is not used should bear on their face a translation of the various items stated in the foreign language. In making out a voucher the address as well as the name of the individual or firm should be indicated.

Each set of vouchers should be serially numbered in an independent series. Where a voucher is drawn against "Home office funds" its number should agree with the number of the check by which the voucher is paid. Each voucher should also plainly indicate by item number the budget item against which it is to be charged.

3. *Description of equipment in vouchers.*—The Commission keeps an accurate record of all equipment and other property purchased in the field. It is important in drawing vouchers to describe carefully all such property by manufacturer's number, size, type, or other definite identification.

Outlays for property which are not budgeted as such but which are paid for out of the contingent fund should be described as such on the voucher by writing "outlay" after the item.

4. *Use and disposition of copies of vouchers.*—

(*a*) IN MAKING PAYMENTS OUT OF "FIELD OFFICE FUNDS."

1. The original and duplicate copies of the voucher, together with the supporting bill, will be sent to the proper party for receipt.

2. The triplicate copy will be kept on file to check up the return of the original and duplicate copies and to protect the field office in case of loss in the mail.

3. On return of the original and duplicate copies, together with bill properly receipted, the original and the bill (both receipted) will be kept in the files of the field office until the close of the quarter when they will be sent to the Commission at Washington, D. C. The duplicate and triplicate copies will be filed in the field office, the duplicate in a permanent file, and the triplicate in a temporary file for use in bookkeeping and for destruction after a period of one year, if no other use is found for it.

(*b*) IN MAKING PAYMENTS OUT OF "HOME OFFICE FUNDS."

1. The original and duplicate copies of the voucher, together with the supporting bill and check drawn by the field office on the Washington bank of deposit, will be forwarded to the Commission at Washington. The Commission will in turn forward the papers to the proper person for receipt. On return to the Commission of the papers described the original copy of the voucher and the bill will be retained in the files of the Commission. The duplicate copy of the voucher will be returned to the Director in the field from whose office it emanated.

2. The triplicate copy of the voucher will be retained in the office of the Director in the field to check up the return of the

receipted duplicate from the Commission at Washington. On receipt of the duplicate from the Commission the use and procedure will be the same as in case of duplicate receipted vouchers received for payment of bills from "Field Office Funds."

5. *Supply of funds for field office and home office account.*—The Commission will be notified one month prior to the close of each quarter, or earlier if practicable, as to the estimated amount of all bills which are to be paid for out of "Home Office Funds" during the next ensuing quarter. The Commission will then draw one voucher to cover the amount of the budget which is to be used in the payment of bills from the "Field Office Funds," and a second voucher to cover the amount of the budget which is to be used in the payment of bills from the "Home Office Funds." The check received from the Foundation headquarters in New York to supply "Home Office Funds" will be deposited with the Washington bank of deposit. Duplicate deposit slips properly certified will be forwarded to the Director in the field for his information.

Every effort should be made to estimate carefully the amount of money which will be required to pay bills incurred in the United States within a given quarter. Should, at any time, the total payments exceed the amount available in the "Home Office Funds" of the field office concerned, the International Health Commission will temporarily advance the money needed to meet the unexpected demands upon such funds. Any excess amounts thus paid for field offices will be adjusted at the time of the remittance for the next ensuing quarter. In case of the completion of a campaign within a particular quarter in which excess payments were made by the International Health Commission, the field office will remit to the International Health Commission the amount due, together with such other unexpended balance as may remain in the hands of the field office, at the time of the close of the campaign.

Remittances made to field offices will, wherever expedient, be made through the office of the Director in Charge. In other cases a statement showing the details of the remittances will be sent to the Director in Charge and the voucher and check sent directly to the foreign government or to the local subordinate in charge in a particular country.

No checks will be drawn against vouchers until they have been properly approved by the director responsible for the fund out of which paid and by the proper authority of the foreign government wherever such approval is required.

6. *Deposit of field office funds.*—Whenever money is deposited for field office funds such deposits will be made to the credit of the International Health Commission. Payments from the fund will be made in the name of the International Health Commission, and the receipt taken, as indicated by the voucher form, will likewise be in the name of the International Health Commission.

7. *Contingent funds for field use.*—In order that the contingent fund for field use may be kept at a minimum, every effort should be made to budget expenses. A contingent fund ledger record will be kept in each office of a Director in the field. This record will be supplemented by a petty cash record showing, by voucher numbers, the amounts withdrawn for petty cash purposes as well as the item to be credited to the petty cash account.

Vouchers drawn against the contingent fund will be a part of the numerical series of vouchers drawn against "Field Office Funds." In addition to the budget item number, they will bear the designation "Contingent Fund" written or stamped across their face as a double check to avoid error where the object of expenditure resembles objects ordinarily reported under other budget items.

8. *Quarterly report.*—On the first day of each quarter, or as soon thereafter as possible, every field office will report to the Commission the total of its receipts and expenditures for the quarter. A form for this report has been provided.

9. *Transmission of vouchers.*—Vouchers covering payments from field office funds will be transmitted to the Commission at the close of each quarter. The vouchers will be mailed under separate cover from a letter of transmittal, a form for which has been provided. This letter will show the total number of vouchers transmitted, together with their serial numbers. At the close of a quarter vouchers will at times not have been returned to the field office by parties to whom sent for receipt. In such case no vouchers will be transmitted until all vouchers issued during the quarter have been returned to the field office properly receipted. An exception will be made only where an unusual delay of more than two weeks is likely to occur.

SAMPLE FORM OF QUARTERLY FINANCIAL REPORT.

......................191..

INTERNATIONAL HEALTH COMMISSION,
725 Southern Building, Washington, D. C.

DEAR SIRS: Herewith please find quarterly financial report for the quarter ending..................191..

RECEIPTS.	Foreign currency.	
	Receipts.	Expenditures.
Balance from preceding quarter..........	....	.....* * *.....
Receipts during quarter..................	....	.....* * *.....
EXPENDITURES.		
Deficit from preceding quarter............	...* * *...	....
Charged against field office funds, voucher Nos. —— to ——....................	...* * *...	....
Charged against home office funds, voucher Nos. —— to ——....................	...* * *...	....
Totals.........................	....	....
Balance to next quarter.................	....	....
Summary in U. S. Currency.		
Total receipts...........................	....	.....* * *.....
Total expenditures......................	...* * *...	....
Balance to next quarter.................	....	....

Very truly yours,

Director for..................

SAMPLE FORM OF LETTER OF TRANSMITTAL OF VOUCHERS.

..................191..

INTERNATIONAL HEALTH COMMISSION,
725 Southern Building, Washington, D. C.

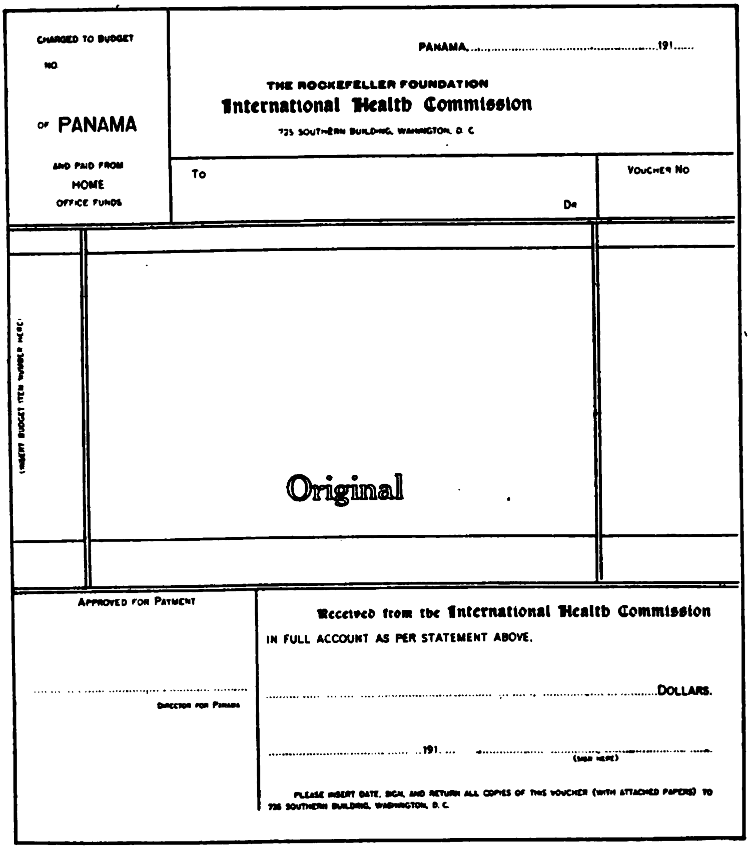
DEAR SIRS: Under separate cover I am forwarding to you .... original vouchers, together with supporting bills, both receipted, covering expenditures made during the quarter, ending .... 191.. out of Field Office Funds and numbered serially from .... to ....

.... original vouchers drawn against Home Office Funds and numbered serially from .... to .... were forwarded to the Commission during the quarter.

Very truly yours,

Director for..................

SAMPLE FORM OF VOUCHER.



CHARGED TO BUDGET

NO.

OF PANAMA

AND PAID FROM
HOME
OFFICE FUNDS

PANAMA, ...191......

THE ROCKEFELLER FOUNDATION
International Health Commission
725 SOUTHERN BUILDING, WASHINGTON, D. C.

To

Dr

VOUCHER NO

INSERT BUDGET ITEM NUMBER HERE.

Original

APPROVED FOR PAYMENT

....
DIRECTOR FOR PANAMA

Received from the International Health Commission
IN FULL ACCOUNT AS PER STATEMENT ABOVE.

....DOLLARS.

....191. ...   .
(SIGN HERE)

PLEASE INSERT DATE, SIGN, AND RETURN ALL COPIES OF THIS VOUCHER (WITH ATTACHED PAPERS) TO 725 SOUTHERN BUILDING, WASHINGTON, D. C.

GENERAL LIBRARY
UNIVERSITY OF CALIFORNIA—BERKELEY

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